

F-16 VENTRAL FINS

COMPONENT PURPOSE/REQMTS:

- stabilize aircraft during high angles of attack
- subjected to aerodynamic loading
- require high strength and stiffness

COMPONENT CONFIGURATION:

- 2024-T4 Al skin over a central root rib, attached to the fuselage via a front and rear spar
- internal honeycomb structure

PROBLEM:

- catastrophic failure from aerodynamic buffeting, resulting in rolling moment and first-mode torsion
- peak-to-peak amplitude of fin bending was 10 cm
- high down-time, high support cost, warranty issues

PREFERRED SOLUTION:

- equivalent form, fit and function to avoid additional certification costs
- field supportable (i.e., repair of battle damage)
- affordable

CANDIDATES:

- graphite/epoxy skin over existing spar
- increased thickness of 2024-T4 Al skin
- Al 6092/SiC/17.5p DRA skin



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TEAM AND APPROACH:

- Lockheed Martin, USAF Ogden ALC, DWA Al Composites, USAF Materials Manufacturing Directorate, AF Title III Program Office
- collaborative design trade, M&P studies
- MIL-HDBK 5 data generation
- full scale flight certification with Royal Netherlands Air Force

MATERIAL AND PROCESS:

- *Al 6092/SiC/17.5p* DRA sheet
- P/M billets ($\phi = 51\text{cm}$) extruded and rolled to final thickness of 1.0 mm or 3.2 mm
- sheared, HT, quenched and stretch-flattened
- sheet was inserted in existing repair line

RESULTS/PAYOFF:

- DRA sheet provides 40% increase in stiffness relative to design baseline, nearly eliminating 1st mode torsional loading
- peak deflections reduced by ~50%
- testing suggests a 4X improvement in life
- ~\$26M savings in life cycle costs from reduced maintenance, downtime, inspection

